

CENTER FOR COMPOSITE TECHNOLOGIES

MISSION

The mission of the Center for Composite Technologies of the Institute of Aviation is to deliver composite technology solutions and composite material tests for the aviation industry.

The Center combines:

- Composites Testing Laboratory,
- Composite Structures Manufacturing Division,
- Project Management Division.

Composites Testing Laboratory is authorized to perform accredited tests of composites in accordance with the international standard ISO/IEC 17025. Technical competences have been confirmed by Polish Center for Accreditation.

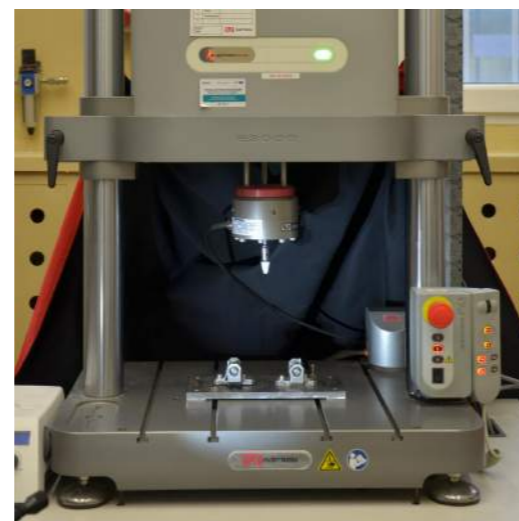
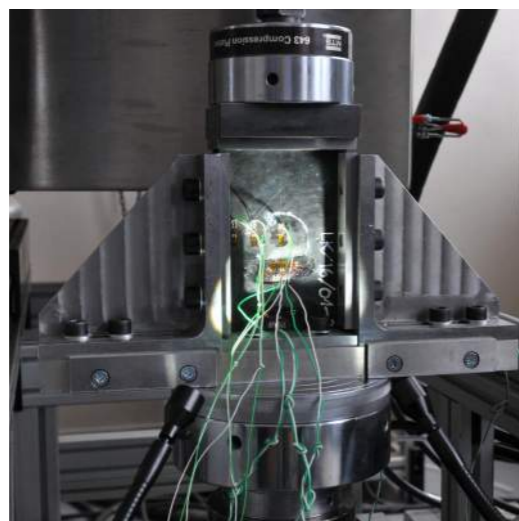
FIELDS OF ACTIVITY:

- mechanical tests according to ASTM standards to determine composite material properties and create a material database,
- technology development for composite components manufacturing with usage of out of autoclave prepregs,
- monitoring of delamination progression in composite materials with usage of numerical (NASTRAN, MSC MARC, ABAQUS) and experimental methods,
- detection of defects and analyzing its progression in composite materials by ultrasonic and visual NDT methods.



AB 1490





COMPOSITES TESTING LABORATORY

STRENGTH TESTS

MTS 322 test frame:

- temperature range: -130°C ÷ 315°C, -196°C (tension),
- loading range: 0 - 250 kN.

Conducted tests:

- tension - ASTM 3039,
- compression - ASTM D3410 and ASTM D6641,
- open-hole compression - ASTM D6484,
- open-hole tension - ASTM D5766,
- compression after impact - ASTM D7137,
- losipescu shear test - ASTM D5379,
- in-plane shear - ASTM D3518,
- three-point bending - ASTM D790,
- long beam flexure - ASTM D7249,
- flatwise tension - ASTM C297.

INSTRON ElectroPuls E3000 test frame:

- loading range:
 - 0 - 2100 N for static tests,
 - 0 - 3000 N for dynamic tests,
- maximum frequency: 300 Hz,
- stroke: 60 mm.
- Conducted tests:
 - interlaminar fracture toughness:
 - mode I - ASTM D5528 (static test) and ASTM D6115 (fatigue test),
 - mode II - ESISTC4 protocol,
 - mixmode - ASTM D6671.
 - short beam shear - ASTM D2344,
 - roller drum peel - ASTM D 3167,
 - climbing drum peel - ASTM D1781.

IMPACT TESTS

Instron CEAST 9350 Drop Tower:

- energy range: 0.59 - 1800 J,
 - impact speed: 0.77 - 24 m/s,
 - drop height: 0.03 - 29.4 m.
- Conducted tests:
- damage resistance - to ASTM D7136.

PHISICO-CHEMICAL TESTS

Dylatometer Anter UNITHERMTM 1000:

- temperature range: -196°C ÷ 1100°C.
- Conducted tests:
- thermal expansion - ASTM E228.

Dynamic mechanical analyzer Perkin Elmer DMA 8000:

- temperature range: -180°C ÷ 400°C.
- Conducted tests:
- glass transition temperature - ASTM D1640 and ASTM D7028.



COMPOSITE STRUCTURES MANUFACTURING DIVISION

NON-DESTRUCTIVE TESTS

Olympus OmniScan MX flaw detector:

- system with ultrasonic phased array module 128:32 and conventional ultrasonic module UT 2C.
- Conducted tests:
- defects evaluation in monolithic composites.

Olympus BondMaster:

- pitch-catch, MIA (mechanical impedance analysis) and resonance modes technics.
- Conducted tests:
- defects evaluation in honeycomb structures.

CNC router KIMLA BPF2070:

- working area: 7x2x0.5 m.

Ovens:

- oven for initial and post-cure of composite structures, oven capacity: length 10 m, width 2.4 m, height 2 m, max operating temperature 200°C,
- precision oven for specimen preparation.

Environmental chamber:

- capacity: 280 L,
- Width x Length x Depth: 720x690x560,
- temperature range: from -75°C to +180°C,
- temperature range with humidity: from 10°C to 95°C,
- relative humidity range: from 10% to 98%.

SPECIMENS PREPARATION:

Specimens cutting machine:

- table working area: 1320 mm x 320 mm,
- digital readout - 3 axles,
- feed: 20 - 360 mm/min,
- rotational speed: 58 - 1800 rev/min.

Edge specimens grinder:

- table working area: 250 mm x 600 mm,
- max length of grinding: 600 mm,
- grinding wheel min feed: 0.001,
- grinding wheel max feed: 0.06,
- spindle revolutions: 2900 rev/min.

PROJECT MANAGEMENT DIVISION

AREAS OF EXPERTISE:

- R&D projects management,
- development of test programs and analysis of test results in context of certification processes,
- coordination of research activities within the project consortia,
- cooperation with research centers in Poland and abroad.

RESEARCH ACTIVITIES:

- static and dynamic numerical analysis of composite materials and structures,
- research studies of failure criteria for composites,
- damage tolerance evaluation,
- composite structures technology development,
- inverse problems in mechanics of materials.

